The

MONTHLY REVIEW

Published Monthly by the

American Electro-Platers Society

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTRO-PLATING

DECEMBER, 1922

v. 9 #12

Entered as second-class matter, September 26, 1922, at the Post Office at Oneida, N. Y., under the Act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of October 3, 1917, authorized September 26, 1922.

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BANQUET ANNOUNCEMENT

New York Branch Banquet

The New York Branch Banquet is one of the big events of the year for the platers in the East.

It is to be held at Adline Club, Broadway and 23d Street, Saturday, February 17, 1923, New York City. Meet me there for the afternoon session.

Bring the ladies.

St. Louis Banquet

The big event in the West will be held at American Annex Hotel, Saturday, January 13, 1923, afternoon. Educational program. Mr. Guy White and E. W. Heil are among the speakers.

Banquet at 6:30 P. M. Ed. Musick says the jazz will be the best ever.

MONTHLY REVIEW

Published by the

American Electro-Platers' Society

ONEIDA, NEW YORK

Editor's Office, 166 Willow Place, Sherrill, New York

VOL. IX DECEMBER No. 12

EDITORIAL

A MESSAGE FOR THE NEW YEAR

To All Officers and Members of the A. E. S. Greeting!

This New Year's season brings us to just one more of life's beginnings. Every year should make each of us "Stop, Look and Listen." Every year should make each of us much better, in some way, than we were the year before. Every year should bring us its trials, its own special and peculiar pleasures, its new duties, its new knowledge, in fact, each year should be a new and better experience than the year before.

Since the passage of the eighteenth amendment to our National Constitution, most of us have gotten entirely out of the habit of making New Year's resolutions. It is one of the national pastimes that has become almost obsolete from disuse; nevertheless, and in spite of all the signals of distress that are shown by many of our friends, the most of us will never have to make that old resolution again.

In spite of the facts mentioned above, I feel that we really need to return to the old custom once more; therefore, I am submitting a few resolutions that would make our good A. E. S. even better and of more use to all of its members and to our entire profession.

The A. E. S.—Resolved, That, as a socity with education as its principal object, we must strive to do the most toward the education, not only of our members, but also of the young men that are to follow us in our respective fields of usefulness. We must also resolve to keep our Society entirely free from all suspicion of commercialism.

The Branch—Resolved, That our Branch shall be willing

to carry our entire share of the Society's load; that we will require our officers to attend all their duties, and, in no way let any other Branch claim to have borne any part of the work of our Branch. We further resolve to secure every eligible person in our territory for attendance at one or more of our meetings during the winter months; using all fair argument to secure them as members of our branch; realizing as we do that the greater our local membership the more we can do for each of our members; and for the Society as a whole.

The Member—Resolved, That I will attend each of the meetings if it proves at all possible; that I will not hesitate in giving an answer to any question which my experience peculiarly fits me to answer; that I will not fail in asking advice if in trouble and, that I will do all the work that I can to promote the success of my fellow members of my Branch, and of the whole American Electro-Platers' Society.

With every feeling that inspires the above resolutions, and with the personal wish to every one of our Officers and Members for a very happy and prosperous New Year, I am,

Yours very truly,

WALTER J. ALLEN,
Supreme President.

CONTROL OF ACIDITY IN NICKEL DEPOSITION[1]

By W. Blum and M. R. Thompson[2]

[1]Published by permission of the Director of the Bureau of Standards, U. S. Department of Commerce.

[2]Chemists, Bureau of Standards, Washington, D. C.

I. INTRODUCTION

The present investigation was conducted as a part of a general program on the study of nickel deposition in progress at the Bureau of Standards. It has long been recognized that acidity is an important factor in securing good deposits of nickel, but up to very recent times methods for its measurement and control have not been generally known or applied. A study of the regulation of acidity has therefore been made, the results of which have been published in considerable detail.[3] The purpose of the present paper is to

[3]M. R. Thompson, "The Acidity of Nickel Depositing Solutions," Trans. Am. Electrochem. Soc. 1922, 41.

explain in simple terms the principles involved in the various methods proposed for measuring acidity and their possible applications to commercial nickel plating and electrotyping. For details the original artticle should be consulted.

II. GENERAL PRINCIPLES

The fundamental principles of acidity were discussed in a previous paper.[4] This article should be consulted in connection with the present paper. It may be summarized as follows:

[4]W. Blum and M. R. Thompson, "Principles Underlying the Acidity of Nickel Plating Solutions." Monthly Review Am. Electroplaters' Soc. August 1921, **8**, No. 8.

All acids when dissolved in water are decomposed or "dissociated" to a certain extent, with the formation of hydrogen ions. The extent of the dissociation is a measure of the strength of an acid. Sulphuric acid is strong, i. e., forms a high concentration of hydrogen ions; acetic acid is weak (forms few hydrogen ions), and boric acid is very weak (forms very few hydrogen ions). It is necessary, therefore, to distinguish between the concentration of **acid** and the concentration of **hydrogen ions** in any solution. The former is a measure of the amount of acid present, the latter of the **degree of acidity.** This latter may be expressed in various ways, the simplest being in terms of the pH system. In this system a pH of 3 indicates that the hydrogen ion concentration is 1/1000 normal (i. e., $1/10^3$), and a pH of 4, 1/10,000 normal (or $1/10^4$). The larger the number of the pH, the smaller the acidity, and vice versa. Thus a solution with pH = 5, is only 1/10 as acid as one with pH = 4. For many practical purposes the numbers in the pH system may be considered as arbitrary points on a scale, similar to gage numbers for wire and sheet metal, which also increase as the size decreases.

III. MEASUREMENT OF ACIDITY

It is possible in any solution, such as one used for nickel plating, to determine the total concentration of "free acid" by means of a suitable "titration." It is also possible to measure the degre of acidity by means of indicators. Either method gives information which may be useful, and in certain cases both methods may be applied to advantage. As, however, the degree of acidity is usually most directly

related to the behavior of the solution, its measurement will be described first:

1. Degree of Acidity.

The degree of acidity may be measured "qualitatively" or "quantitatively." In the first method, the purpose is simply to determine whether one solution is more or less acid than some other solution arbitrarily chosen for comparison. In the latter method the extent of the difference in degree of acidity is expressed numerically.

In both cases certain dyes known as "indicators" are employed. For practical purposes an indicator may be defined as a substance whose color changes definitely with a change in the pH or degree of acidity of a solution. All platers are familiar with litmus, usually applied as litmus paper, which has a pink color if a solution is "acid," blue if "alkaline" and purple if "neutral." The terms acid, alkaline and neutral are, however, relative terms, and for their precise definition accurate measurements may be required. For this purpose a great number of indicators have been developed, each of which has a sensitive color change in some portion of the pH scale.

A. Qualitative Tests.

When litmus paper is introduced into a nickel plating solution, a rough indication is obtained from the color produced, as to whether the solution is acid or alkaline, or more strictly speaking, whether it is more acid or more alkaline than a solution which would produce a purple or neutral tint with litmus. For testing solutions it is preferable to employ solutions of indicators, as it is difficult to secure test papers of uniform color, or to compare their colors accurately. Storey[1] has described the use of methyl red for this purpose.

[1]O. W. Storey—A Simple Method for Maintaining the Neutrality of Nickel Plating Solutions.—Monthly Review, Dec., 1921, 8, No. 12.

In his method, a few drops of the methyl red solution are added to a definite volume (e. g., 5cc) of the plating solution contained in a small tube, and the color of the solution is noted, and may be compared with the color produced in a sample of any other solution. Such a test indicates whether the solution is more or less acid than has been found desirable in that plant.

It has been found by us that in the pH range in which most nickel solutions give good deposits, another indicator,

"bromcresol purple," is somewhat more sensitive and convenient than methyl red. Its solution is applied just like the methyl red above described, and the neutral color (green) is very close to the pH usually desired. The preparation of the indicator solution is described later in this paper.

B. Quantitative Tests.

If a nickel solution is tested with litmus paper and also with congo red paper (the colors of which are the reverse of litmus, i. e., are pink for alkaline and blue for acid), it may be found that the solution is apparently acid toward litmus (turns it pink) and alkaline toward congo red (also turns it pink). By this double test it is possible to define the acidity as within (or outside of) certain approximate limits. Litmus turns pink at about pH = 6 and congo red at about pH = 4, therefore the above solution would have an acidity within those limits. By testing with both litmus and congo red, the solution may be controlled somewhat more accurately than with litmus alone.

The actual measurement of the pH, or degree of acidity, is similar to the test just described, in that it defines the acidity within certain values, which are fixed by specific colors of suitable indicators. The standards of comparison may consist either of solutions of known pH independently measured or of tubes containing indicators in such proportions as to produce colors corresponding to definite pH values. The latter, known as the drop ratio method, is most convenient for approximate measurements.

If an excess of acid is added to a solution containing a definite amount of an indicator, all of the indicator will acquire the color corresponding to the acid color of that indicator. If instead an excess of alkali is added to an equal amount of indicator under the same conditions, the alkaline color is produced. If now the acid tube is held in front of the alkaline tube the apparent color observed when light is transmitted through the two tubes will be the same as if the degree of acidity were such that half of the total amount of indicator used was converted to its acid color and half to its alkaline color. The pH corresponding to definite ratios of the acid and alkaline tubes must be determined separately. This has been done for the usual indicators and the data have been published in tabular form as illustrated in

Table I. More detailed information regarding indicators and the measurement of pH will be found in a recent book by W. M. Clark.[1]

[1]W. M. Clark, "The Determination of Hydrogen Ions," Williams and Wilkins Co., Baltimore, Md.

Table I

Constants for Indicator Color Standards

(Continued on page six)

Drop Ratio			pH Number for each pair of tubes	
Alkaline Tube		Acid Tube	Methyl Red	Brom-cresol Purple
1	:	9	4.05	5.3
1.5(3)	:	8.5(17)	4.25	5.5
2	:	8	4.4	5.7
3	:	7	4.6	5.9
4	:	6	4.8	6.1
5	:	5	5.0	6.3
6	:	4	5.2	6.5
7	:	3	5.4	6.7
8	:	2	5.6	6.9
8.5(17)	:	1.5(3)	5.75	7.0
9	:	1	5.95	7.2

To apply the drop ratio method, small glass tubes are arranged in pairs in a convenient rack. Each of the tubes should have a scratch mark at a point corresponding to a volume of 5.2 cc (as measured from a burette). To each pair of tubes the same total volume (10 drops) of indicator solution is added, but in defferent proportions in the front and back tubes of the pair. Thus, in the first pair, 1 drop of indicator is placed in the front tube and 9 drops in the rear tube; in the second pair there may be 2 drops in front and 8 in back, and so on. (For practical purposes it is usually found convenient to prepare tubes having ratios of 1.5 to 8.5, at each end of the scale. These are conveniently made up by using 3 and 17 drops of an indicator solution half as strong as that usually employed.) A few cc of distilled water is added to each tube, and to each of the tubes in the front row a drop of dilute (about 0.05-N) sodium hydroxide, and to each in the back row a drop of dilute (about 0.05-N) hydrochloric acid is added. Distilled water is then added to all the tubes up to the 5.2 cc mark and the con-

tents are mixed. Under these conditions the colors observed by looking through the two tubes of each pair are the same as would be produced in a tube with 10 drops of indicator in 5.2 cc of solution having the corresponding pH numbers designated in Table I. These colorstan dards may alter and should be freshly prepared at least once a week. The stock indicator solutions are stable.

To test the nickel solution, place 5 cc (after filtering if necessary) in one of the tubes, add 10 drops of the indicator, and mix. When the solution to be tested is colored, as is the nickel solution, it is necessary to place with each pair of color standards a tube containing 5 cc of the nickel solution and 0.2 cc of water. Two tubes of water are placed with the tube of nickel solution containing indicator (oniy one tube of water would be used with a colorless solution). Comparisons are conveniently made in a small wooden block in which nine vertical holes are drilled nearly to the bottom to accommodate 9 tubes, and three horizontal holes are drilled half way up, from front to back, each intersecting three of the vertical holes. The block should be painted black inside and out. The tubes are placed in the block in the order shown in Table II, and the colors are viewed against diffused daylight (e. g., the sky, or ground glass). The purpose is to select two pairs of standard tubes between which as thus viewed lies the color of the nickel solution. If, e. g., this is about midway between the tubes corresponding to a pH of 5.7 and 5.9, the pH of the solution is designated as 5.8. If it closely matches one pair, the pH is the same as of that pair.

Table II

Plan Diagram of Comparator Block

Color Standard Tube (acid)	Water Tube	Color Standard Tube (acid)
Color Standard Tube (alkaline)	Water Tube	Color Standard Tube (alkaline)
5 cc Nickel Solution + 4 drops Water	5 cc Nickel Solution + 10 drops Indicator	5 cc Nickel Solution + 4 drops Water

Either methyl red or brom-cresol purple may be used, but the latter best covers the range of electro-plating and electrotyping solutions. A 0.02 per cent. solution of methyl red may be made by grinding 0.05 g of the dry indicator with a little 95 per cent. ethyl alcohol (or ethyl alcohol denatured with methyl alcohol), dissolving in 150 cc of the alcohol and diluting to 250 cc with distilled water. A 0.04 per cent. solution of brom-cresol purple is prepared similarly from 0.1 g of the dry indicator.

The necessary apparatus for the drop ratio method is given in the following list:

2—Dozen Glass Specimen Tubes (Shell Vials). Medium to thin wall; flat bottom; 12.5 mm (0.5″) outside diameter by 75 mm (3″) high.

1—Test Tube Rack, with a double row of at least six holes; to suitably hold tubes of the above size.

1—Wooden Comparison Block, as per description in text.

4—50 cc (2 oz.) Dropping Bottles; rubber bulb type (one for water, the other three for the following solutions):

50 cc (2 oz.) 0.04 per cent. Alcoholic Brom-cresol Purple solution.

50 cc (2 oz.) of about 0.05-N-Hydrochloric Acid solution.

50 cc (2 oz.) of about 0.05-N-Sodium Hydroxide solution.

2—9 cm (3½″) Glass Funnels.

1—Box Filter Paper, 15 cm diameter.

1—Filter Stand.

1—5 cc Pipette.

1—25 cc Burette.

1—Burette Stand.

2—TITRATION OF AMOUNT OF ACID (OR ALKALI) PRESENT

Measurement of the pH by means of indicators determines simply the degree of acidity, which has a close relation to the character of the deposit produced. If, however, it is found in any case that the pH differs materially from that considered to be favorable, it is desirable to know

how much acid or alkali should be added to restore the desired pH. Such information may be gained by titration of the solution with acid or alkali, using some appropriate indicator. Ordinarily it is assumed (but not always correctly) that in such a titration the actual amount or concentration of free alkali or free acid present in the solution is determined. In the control of nickel solutions, we are not usually concerned with the amount of acid or alkali present in the solution but with the amount of alkali or acid required to "neutralize" the solution, in other words, to produce in it some desired pH. The simplest way to determine this is to titrate the solution with alkali or acid with an appropriate indicator (e. g., brom-cresol purple) until the desired neutral color (a deep green with this indicator) is obtained. If, as has often been done in commercial plants, the solution is titrated with an indicator such as sodium alizarin sulphonate (the neutral point of which is not the same as the pH desired) the results may be of value but not so directly as with brom-cresol purple. In the former case the solution is considered satisfactory when it has a certain definite "alkalinity"; in the latter it is usually satisfactory when "neutral," i. e., not requiring any acid or alkali.

To titrate a sample of nickel solution, first note carefully whether it is "acid" or "alkaline" to brom-cresol purple by adding 5 to 10 drops of the 0.04 per cent. indicator (prepared as previously described) to 50 cc of filtered sample measured into a small flask or beaker. If the color observed is greenish-yellow, the soltuion is "acid" and standard alkali solution will be required for titrating to neutrality. If the color is violet, the solution is "alkaline" and standard acid solution will be required. If the solution shows a deep green color, it is "neutral" to this indicator and no titration is necessary.

Assuming that a given sample is "acid," run in 0.1-N sodium hydroxide from a burette, shaking the flask frequently until a permanent deep green color is produced. Each cc of 0.1-N alkali used in titrating a 50 cc sample corresponds to 0.080 g/L or 0.011 oz./gal. of sodium hydroxide; or to 0.120 g/L or 0.0178 fluid oz./gal. of aqua ammonia (sp. gr. 0.90). If, in a titration as described above, 50 cc of sample required 5.3 cc of 0.1-N sodium hydroxide

to titrate to neutrality, the solution will require for its neutralization:

5.3 x 0.080 = 0.42 g/L sodium hydroxide

or 5.3 x 0.11 = 0.058 oz./gal. sodium hydroxide

For 300 gallons, the total requirement would be 300 x 0.058 = 17.4 oz. of sodium hydroxide (stick caustic soda).

The same solution could be neutralized by adding:

5.3 x 0.120 = 0.64 g/L aqua ammonia (sp. gr. 0.90)

or 5.3 x 0.0178 = 0.094 fluid oz./gal. aqua ammonia (sp. gr. 0.90)

For 300 gallons, the total requirement would be 300 x 0.094 = 28.2 fluid oz. of aqua ammonia.

If another sample of nickel solution proved to be alkaline to the indicator, it should be titrated to the same neutral color of brom-cresol purple, in a similar manner, using standard acid solution. Each cc of 0.1-N sulphuric acid corresponds to 0.105 g/L or 0.0073 fluid oz./gal. of commercial sulphuric acid (sp. gr. 1.84; 66° Be'). If 50 cc of such a sample required 3.4 cc of 0.1-N sulphuric acid, the solution will require for its neutralization:

3.4 x 0.105 = 0.36 g/L Commercial sulphuric acid (sp. gr. 1.84; 66° Be')

or 3.4 x 0.0073 = 0.025 fluid oz./gal. Commercial sulphuric acid (sp. gr. 1.84; 66° Be')

300 gallons would therefore require a total of 300x0.025 = 7.5 fluid ounces of sulphuric acid.

Various substances may be used for neutralizing the solutions in the tanks. Nickel carbonate has the advantage that it introduces no other metals but nickel. On the other hand, its composition is somewhat indefinite and it dissolves slowly. ("Plastic" carbonate dissolves more rapidly but is still more indefinite in composition.) If slight additions are only occasionally required, caustic soda may be used in baths containing sodium chloride, and ammonia in those containing ammonium chloride. In any case, it is preferable to make the additions slowly, and especially if previous experience is lacking to add, e. g., only half the amounts calculated from the titration and to then test the pH before adding the remainder. At best, the calculated amounts are only approximate, owing to the possible presence in the tanks of suspended impurities which may partly dissolve in

and neutralize the reagent added. After each addition the solution should be well mixed and allowed to settle. Such changes are therefore best made late in the day, or on Saturdays.

A convenient stock of apparatus for applying the titration method would include:

2—25 cc Burettes.
1—Double Burette Stand.
1—50 cc Pipette (or a 50 cc graduate can be substituted in most cases).
6—100 cc Erlenmeyer Flasks.
1—Liter of 0.1-N Sulphuric Acid solution .
1—Liter of 0.1-N Sodium Hydroxide solution.
50 cc 0.04% Alcoholic Brom-cresol Purple solution.
1—50 cc Dropping Bottle (rubber bulb type preferred; for containing the indicator).
2—9cm. (3½") Glass Funnels.
1—Filter Stand.
1—Box 15 cm. diameter Filter Papers.

This list of apparatus duplicates a few pieces that are described under the drop ratio method; when ordering supplies, both for that test and for titration work, due allowance should be made for this fact.

IV. CONTROL OF ACIDITY

Under ideal conditions, with equal anode and cathode efficiencies the pH should remain practically constant, since the removal of solution adhering to the work only results in dilution, which has little effect on pH. Acid or alkali may, however, be introduced into the baths from improper rinsing of the work to be plated. In general, an increase in acidity (decrease in pH) is an indication of insufficient anode corrosion and vice versa. Poor anode corrosion may be remedied by (a) the use of more soluble anodes, (b) cleaning the anodes frequently, (c) using a larger anode area, or (d) increasing the corroding power of the solution.

The pH of some nickel solutions is more affected by a given addition of acid or a given deficiency in anode corrosion than is that of others. Those solutions which are least affected are said to be "well buffered." In general, such solutions contain weak acids or their salts. Thus boric acid, used very generally in nickel baths, owes its beneficial

effect principally to its buffer action and consequent regulation of acidity. Solutions containing hydrofluoric acid (or fluorides), together with boric acid, are still better buffered. A well-buffered solution is usually desirable. Whether the use of any given substance to increase buffer action is advantageous or not will depend upon other effects that it may have upon the deposition.

V. EFFECTS OF ACIDITY

Acidity of nickel solutions is only one of the factors which determine the character of the deposits, and it must not be supposed that its control will of itself insure good deposition. If controlled, however, the possibility of poor deposits occurring is decreased and their cause is more readily determined. The following conclusions, drawn from experiments conducted with various types of solutions at the Bureau of Standards, are tentative, and subject to modification when more complet einformation is available regarding the simultaneous effect of acidity and other factors, such as, e. g., the presence of iron in the solutions:

1. In general, good nickel deposits are produced when the cathode efficiency is high, i. e., when there is little hydrogen evolved (so-called "gassing") at the cathode.

2. Within the usual working range the cathode current efficiency increases as the pH increases, up to about pH = 6.

3. For a constant pH, the cathode efficiency increases as the current density is raised, within certain limits, which latter are dependent in part on the type of solution used.

4. Better deposits may be secured in a solution of low pH (high acidity) at a relatively high than at a low current density.

5. Where it is necessary to use a low current density, e. g., on irregularly shaped articles, the pH should be comparatively high (low acidity).

6. Deposits made in a solution of low pH (high acidity) are likely to be finer grained, brighter and harder, but more brittle than those from solutions with high pH.

7. With any pH up to 4, the deposits are bright but very likely to show excessive cracking and pitting. A pH of 4 is, therefore, the lower limit of good deposition.

8. With any pH above 6.5 the deposits are dark, and cracking and curling are likely to occur. In still solutions

it is difficult to obtain good deposits above pH=6.5. In agitated solutions, as in electrotyping, good deposits may be made up to nearly pH=7.

The above conclusions were in general confirmed by observations made in a number of commercial plants. It was found that practically all satisfactory nickel plating is conducted in solutions with a pH between 5.4 and 6.3. The average of the larger plants (in which the solutions were controlled by other analyses) was found to be about 5.7. This value is suggested for trial to those who desire to measure and control acidity in nickel plating. In agitated electrotyping solutions, the average was about 6.3.

VI. CONCLUSION

Acknowledgments are due to many individuals for assistance in conducting the experiments upon which this paper is based, or for supplying helpful advice and criticism; also to various firms for co-operative tests and information. An incomplete list includes Mr. J. H. Winkler for the preparation of deposits and Mr. Howard Scott for the microscopic study of deposits, both of the Bureau of Standards; Mr. George B. Hogaboom, electro-plating adviser to the Bureau of Standards; Mr. H. M. Johnquest; the Research Committee and many other members of the American Electro-platers' Society.

BRANCH NEWS

Connecticut Valley Branch

Connecticut Valley Branch held an open meeting and smoke r on Tuesday, December 12, with an attendance of about fifty members and guests. One application for active membership was received.

After routine business had been disposed of, Mr. Charles H. Proctor was introduced and he told of how the A. E. S. was first formed and of the work it is now doing. Mr. Proctor also displayed samples of cadmium plating and described the methods used in doing this kind of work.

Mr. H. L. Zucker was the next speaker, his subject being "Polishing and Buffing Compositions." This was a very interesting talk and the speaker answered a number of questions concerning his paper.

Both speakers were given a hearty vote of thanks for their kindness in addressing the meeting.

After this there was music by an orchestra furnished by Mr. Bagshaw and refreshments, consisting of coffee, sandwiches and cigars were served. Mr. Gormley brought a vocal quartette up from Meriden and they sang a number of songs, which were very much enjoyed.

Beginning in January the Connecticut Valley Branch will meet on the fourth Monday in each month at 747 Main street, Hartford, Conn.

Newark Branch

Our December 1 regular meeting was also an open meeting. Prior to the meeting a "get-togther" dinner was held at De Jianne's Restaurant, 17 Central avenue, 35 members and their friends being seated at the tables. At 8:15 P. M. President O. J. Sizelover, after a few words of welcome, opened the meeting. Routine business was quickly put through, after which the president turned the meeting over to the librarian, Mr. W. T. Faint, who introduced the first speaker, Mr. Van Winkle Todd, president of the Hanson & Van Winkle Company, who responded with a short speech. Mr. Charles H. Proctor, the founder of the A. E. S., was the next speaker, responding with a well-chosen and fitting short speech. Dr. Harry S. Meyers was next introduced and gave an excellent address on various world events which have transpired and are happening today.

Mr. Faint announced that our president, Mr. O. J. Sizelove, had been appointed on the research committee, which is to meet in Washington, D. C., on December 15, 1922, for a conference at the Bureau of Standards. A short discussion on the streaking of an acid copper deposit was held, after which the president called for a rising vote of thanks to be given to all the speakers of the evening, which brought to a close Newark Branch's first "get-together dinner" and open meeting, which can be recorded as a huge success, and those members who did not attend missed a rare treat.

Meeting adjourned at 10 P. M.

On December 15 Newark Branch held its regular meeting, with President O. J. Sizelove in the chair and 18 members were present. Minutes of the previous meeting were approved as read. Communications were ordered recived, answered and filed. Banquet committee reported progress in securing papers for the afternoon educational session and promised at the January meeting to have settled definitely as to the date. Three new members were elected. Messrs. Sizelove, De Mars, Carlson and Clark gave short talks upon the deposition of black nickel. The samples of Messrs, Sizelove and Carlson exhibited were excellent specimens. Mr. Karl Knoff, our newly elected member, gave a description of the method he used in black nickel plating upon aluminum, viz.: Dip the aluminum articles in caustic soda solution, rinse in water, dip in muriatic acid pickle, rinse, white nickel strike, then black nickel plate; very good results were obtained.

At the January 5 meeting our librarian, Mr. Edward Faint, will read his paper entitled "Master Electro-Platers." Mr. DeWitt Moore will also read a paper. Most of the evening's discussion was upon producing the black nickel finish, both in heated and cold solution. Royal F. Clark told of his experience in plating black nickel upon brass snap-fasteners in a mechanical barrel plating apparatus, after which the fastners were black Japanned in an oblique Japanning barrel.

A barrel three-quarters full of fasteners would be plated four hours in the black nickel solution, rinsed in cold water, then put directly into a centrifugal dryer to be dried without staining.

New York Branch

The regular meetings of New York Branch were held on November 10 and 22, with good attendance.

Some fine samples of galvano work were shown by Mr. Scharr, who gave full details with each sample.

First Sample—Cherub, about 18 inches wide and 6 inches deep plated on fusible metal, 72 hours run, 2 volts, 35 amp. in following solution: Copper sulphate 2 lbs., sulphuric acid 4 ozs., boric acid 1¼ ozs., water 1 gal. Sample was a fine, smooth deposit. Second Sample—Plaque on rubber mould, 36 hours' run, 1½ volts, 6 amp. Copper sulphate 1¾ lbs., sulphuric acid 3ozs., double sulphate aluminum and potassium 2 ozs., water 1 gal. Third Sample—Electrotype on wax mould, 8 hours' run, 2½ volts, 10 amp. Copper sulphate 2 lbs., sulphuric acid 6 oz., oxalic acid 1-10 oz., water 1 gal. Fourth Sample—Reflector on plaster mould, 32 hours' run, 2 volts, 7 amp. Copper sulphate 1¾ hours. Sulphuric acid 3 ozs., ethyl alcohol 2 oz., water 1 gal. Fifth Sample—Tone arm on fusible metal, 42 hours' run, 1 volt, 8 amp. Copper sulphate 1¾ hours, sulphuric acid 6 ozs., water 1 gal.

Mr. Schorr remarked he had best results with the double sulphate of aluminum and potash as a conductor. All the samples shown were of a fine quality and were admired by all present.

Newark Branch

Our regular meeting on November 17 was called to order by President O. J. Sizelove, 15 members being present. The applications of Messrs. Van Winkle Todd, Karl R. Knoff, Walter Johnson and John Heim were read and referred to the investigating committee and to take the usual course. Nnder new business it was decided that at our regular meeting December 1, we would combine with it a social hour by having all members come direct from business to De Jianne's Restaurant, where we would at 7 P. M. partake of supper, after which we would open our meeting. A speaker is to be secured for the evening.

Discussion on acid copper, platinum solutions occupied most of the evening. Meeting adjourned at 10:50 P. M.

Bridgeport Branch

Report of our November 17 open meeting: The speakers' committee obtained Mr. Amos Bissel of the Bissel Varnish Company, Bridgeport, Conn., who gave us a very interesting talk on japans and answered various questions put to him on same. He next demonstrated wood graining effects on metal, showing mahogany and oak grains, their apparatus used and methods to obtain the same, which was very instructive. After answering many questions on this subject, a rising vote of thanks was extended Mr. Bissel for his enlightening talk. Meeting closed 10:30 P. M., with an attendance of 40 members and visitors present.

Report of regular meeting, December 1: Meeting opened at 8:15 P. M., President J. Slattery presiding. Minutes of previous meetings were read and approved. The commmittee on the coming convention reported progress. Several discussions were in order on various matters. Meeting had a large attendance and adjourned 10 P. M.

Cincinnati Branch

The Cincinnati Branch held their monthly meeting of December with a good attendance at the Y. M. C. A. Building. Roll call found all officers present. After minutes and other routine business was gone over the evening was given over to a chat over nickel. It was thrashed out pretty well that hydrofluric acid or sodium fluride added to a nickel solution containing magnesium sulphate does not materialize, as up to date it seems where there is Mg SO_4 in nickel solutions then add sodium fluride it precipitates the Mg SO_4. to the bottom same as a sluge, only in a white state, milky appearance. It acts as a conductor, replacing or taking the place of Mg SO_4. This will be taken up again at the next meeting and then will give you more about the outcome.

We would like to hear of some discussions as to what benefit there is in brass plating, then nickel as far as rusting is concerned; if there is any over copper, then nickel; if so, kindly explain what it is. Will the brass plating, owing to the addition of zinc, stand up better in the end?

Then the question was put up: Is boracic acid a conductor or not to the nickel solution? If so, to what extent?

Now, Mr. Mesle, please give us this information if you can obtain this or put in the Question Box of the REVIEW, as it is an important question to decide. The outcome to this will be of good value to many, so do the best you can and. Closing with the best wishes for a Merry Christmas and a Happy New Year.

Providence-Attleboro Branch

The Providence-Attleboro branch had to postpone their banquet, which was to have been held on the 9th of December, to Saturday night, January 20, 1923. The postponing was caused by unavoidable circumstances, but we hope to benefit by it, as we will have more time to make arrangements. In the October REVIEW Prov. Attleboro asked some questions on bright silver plating. We were very agreeably surprised by receiving some fine samples of bright silver plating from Sheffield, England, sent us by a member of the New York Branch. The REVIEW certainly reaches a great distance. Our committees are very busy arranging de tails of convention program, and the work as outlined shows proof of a very efficient committee.

Some of the boys are interested inu radio and all of them are hoping that they will be fortunate enough to secure the prize radio set that is to be given out. We would like to hear from some of the other branches in regard to white gold plating. We have tried many solutions, but they do not give the desired result. The plate is acid-resisting, but does not have a good color, inclining toward yellow. We have tried nickel with gold and find it very hard to get the nickel to deposit from a cyanide solution. Cadminum and zinc have been tried, but not with satisfactory results.

Providence-Attleboro's Branch extends a hearty invictation to all branch members who are in the vicinity of Providence to join us at our banquet Saturday night, January 20, 1923, in the Biltmore Hotel. Our next meeting will be held Thursday, December 21,

Chicago Branch

The regular monthly meeting of Chicago Branch, A. E. S., was held this date, President Bott presiding, and all officers present; also a large gathering of the members and visitors.

We had one new application and we elected to active membership four new members.

The president appointed as a committee to draft resolutions on death of our beloved member, William S. Moore, Mr. E. Lamoureaux, Mr. F. J. Liscomb and Mr. O. E. Servis.

Our banquet committee reports that Dr. William Blum cannot be with us on our eleventh annual banquet, but Dr. O. P. Watts and Supreme President Allen will be there, and they have several papers of real promise to be read and present. Inquiries indicate a large gathering of the boys.

Mr. O. E. Servis tendered the third section of his paper and still has one more to read, after which we will send it to you for publication in the Review. Mr. E. Lovering of the Detroit Branch was in our midst.

Chicago Question Box

No. 1. Question—How can kenerled brass be cleaned of burnt oil before nickeling?

No. 1. Answer—Advised to clean off oil before soldering then pickle in sulphuric pickel. Bright dip or clean in an electric cleaner, using reverse current.

No. 2. Question—Using chloride of soda or chloride of amoniam, a nickel solution. What is the decomposition while current is passing and to what poll does the ehlorine pass?

No. 2. Answer—It was thought that the chlorine, passed to the anode, and had a very decided action on the anode, forming chloride of nickel ion.

No. 3. Question—Has anyone present any information on a rust-proof solution using barum chloride?

No. 3. Answer—No member present had heard of any.

No. 4. Question—Ball burnishing on steel. How full should the barrel be; what quantity of balls, and what percentage of work, and what percentage of balls?

No. 4. Answer—If work is small round pieces 65% work and 35% balls, and if work is flat pieces, 35% work and 65% balls and fill barrel within - inch of top with water and use plentiy of soap.

This concluded our evening, and before we close we wish to extend a Merry Christmas to every branch and its officers and members in the Society and well wishes for a Prosperous and Happy New Year in the A. E. S.

Pittsburg Branch

Pittsburg Branch, through its secretary, reports only five members at their last meeting on December 2. They have a fine place for their meetings and the Bureau of Mines has placed any chemical equipment and movie reels at their disposal, which should tend to make for interesting meetings. The secretary is very anxious that Pittsburg may get stirred up for real work in 1923.

Cleveland Branch

Dear Editor: As it has been some little time since you have heard anything from the Cleveland Branch it behooves me to get over my fit of procrastination and send you a few notes on happenings in our fair burg. Speaking of the open meeting that the branch held on November 4, it is everyone's opinion that it was one grand success from an educational point of view. As far as getting more members through that scheme it is up to the boys now to make the best of the publicity we achieved and get their applications in.

The lecture given by Mr. Koph on corrosion of metals, etc., was fine. The local papers gave it a good write-up and I am in receipt of several letters from technical engineers and educational men who congratulate us very highly on the exceptionally fine work of our lecturer and expressed their desire to attend all future affairs of that nature that the branch arranges for. Several professors of chemistry from the city's technical schools and colleges were in attendance, as were also the research engineers from some of the large manufacturing plants, and they were all highly impressed by Mr. Koph's ability to present the matter in plain English so that everybody had a complete understanding of his explanations on corrosions and preventatives for same. Mr. Koph lectured for better than three hours and nobody left before he finished, so you can imagine that his subject was more than ordinarily interesting. In conjunction with his lecture he had arranged with the American Rolling Mills Company for moving pictures of the process of rolling and tempering and annealing work as it is done on a large scale in their plant in Middletown, O. This feature of the program was an eye-opener to us ordinary platers and sure was educational, as it instructs us of methods employed to get the raw material in condition so the manufacturers can go ahead and get things ready for the plater.

Our banquet on November 18 was well attended. We departed from our usual method of having plating served on the speakers' program, and as we had the ladies with us on this occasion, we decided to have someone to head the list of speakers that could talk on some subject that our wives and daughters don't have to listen to every time the old man comes home from work, so we arranged with our fellow townsman, Mr. Petr Witt, to give his views on current matters. The new Union Station that is proposed to be built on our Public Square was his subject. It was a subject that the ladies as well as the men folks could understand, and it made a hit. Our old friend, Mr. Charles Proctor, was with us and gave the boys and girls a good talk. This being the first time Mr. Proctor had been able to attend one of our functions we were delighted to have him with us and hope he can come again.

A newspaper account of Mr. Koph's lecture says:

Two billion, five hundred million dollars are wasted in America each year through corrosion and rust of iron and steel, M. G. Koph told the Cleveland section of the American Electro-Platers' Society at Hotel Cleveland last night.

More than 500,000,000 tons of coal are consumed each year in replacing this loss through corrosion, which may be described as a disease

eating into the backbone of American industry, the speaker declared. He is consulting engineer of the McCormick laboratories, Dayton, O.

"America has been resting upon its war record for three years," he said, "and has been bragging about the production turned out at that time. We must, however, get down to a more economic basis to meet European competition.

"For years American manufacturers have searched for someone to blame for the failure of their products to withstand corrosion. Sometimes the fault has been placed on the finisher, sometimes on the electroplater, sometimes on the enameler, and sometimes on the raw product. Most frequently the manufacturer is at fault; he has tried to combine materials which react when placed together.

'Strain and stress must be considered; failure to reckon with these factors frequently has been the cause of unsatisfactory work. The manufacturer must study the proper methods of overcoming them."

Milwaukee Branch

The regular meeting of Milwaukee Branch was held November 9, with President R. Goodsell in the chair.

There were three new applicants elected to membership.

Milwaukee Branch has seventeen membrs in their chemistry class which meets every Wednesday night at the continuation school laboratories.

All of the boys are taking very much interest in their work. We have two classes, a beginner's class and advanced class.

Detroit Branch

Regular meeting of Detroit Branch, A. E. S., held in the Old Colony Club, Tullar Hotel, our permanent meeting place, Friday, December 1, O. H. Phelps presiding, minutes of previous meeting read and approved. Communication from F. J. Hanlon received, also two requests for platers from out of town concerns, we were unable to fill. All Detroit members should notify secretary when out of employment.

Under good of order: Question No. 1—What causes zinc deposit to show bluish streak after rinsing in hot water? Answer—Due to excess of aluminum salt and was eliminated by adding zinc sulphate and sulphuric acid to plating solution. Question No. 2—What percentage of copper salt will spoil nickel solution—will .20 be sufficient? After considerable discussion, left open; suggestions from other branches or authorities more than welcome.

Other discussions were anode solubilities, etc. Best commercial method of securing a durable plate on automobile bumpers.

Questions for next meeting: Does decrease of anode surface in reasonable amount cause decrease of amperage with same amount of cathode area in each case? No. 2—Will addition of anode surface increase the throwing power of solution with equal cathode area and why or why not? No. 3—Will addition of anode surface, even though not dissolving because new anodes increase throwing power of solution with equal amounts of

cathode area in each case, and why or why not? George B. Hogaboom and other shining lights, get busy. Attendance small but peppy.

Boston Branch

Boston Branch met Friday, November 17, at the American House, with President Nihan in the chair. The regular order of business was gone through. John J. Draine, who was suspended at the last meeting, was reinstated, having paid up his back dues. The committee representing Boston branch on the convention committee made a report of one of progress, stating that it will be the best convention ever held. A discussion on the nickel solution took place, each member telling of the different way he makes his solution. It worked around to die castings, and this lasted for an hour. The meeting adjourned at 10 P. M.

Boston Branch met Friday, December 15, at the American House, with President Nihan in the chair.

We had a large attendance, which made it a very interesting meeting.

After the regular order of business discussions on different solutions was on for fair. Nickel, copper and silver were the main points discussed.

This lasted for about an hour, when the meeting adjourned at 10:30 P. M.

ELECTED TO MEMBERSHIP

Newark Branch

Associate, Van Winkle Todd..Care Hanson & VanWinkle Co., Newark,N.J.
Active, Karl R. Knopf.....823 West 5th St., Plainfield, N. J.
Active, John Heim.....91 William St., Newark, N. J.
Active, Walter Johnson.....1010 Columbus Ave., Westfield, N. J.

Milwaukee Branch

Arthur Schmitt .....476 40th St., Milwaukee, Wis.
Henry Heckenback .....28 4th St., Milwaukee, Wis.
Martica Nishwitz .....1833 West 6th St., Milwaukee, Wis.

Cleveland Branch

Harry Hoopwood .....1613 East 75th St., Cleveland, O.

Pittsburgh Branch

William Frederick Meyers.....518 Concord St., Corry, Pa.

Montreal Branch

Cyrille Gingras .....75½ Latourelle St., Quebec, P. Q.

Chicago Branch

Ramond Heingarten .....1301 Ewing St., Fort Wayne, Ind.
John E. Fox .....126 S. Clinton St., Chicago, Ill.
Robert Wilson .....444 W. 57th Place, Chicago, Ill.
Charles Barton .....431 E. Church St., Jacksonville, Fla.

SUSPENSIONS

St. Louis—Sidney J. Kelsey
Chicago—Frank Fritsch, E. A. Wells
Detroit—A. E. Uorgen, A. E. Jones

Waterbury Branch

John Jacobson .....27 Wakefield St., New Britain, Conn.

APPLICATIONS FOR MEMBERSHIP

Providence Branch

Arthur Jerome .....Rutherglen Ave., Providence, R. I.

Newark Branch

Walter Johnson .....1010 Columbus Ave., Westfield, N. J.

Cincinnati Branch

Active, Anthony J. McGuire.....2331 Duncan St., Louisville, Ky.

Detroit Branch

L. J. Moore .....2546 Springwells Ave., Detroit, Mich.
Mr. Murphy .....Lincoln Motor Car Co., Detroit, Mich.
Arthur Fitzgerald.....470 Ouelet Ave., Windsor, Canada

Chicago Branch

Earnest Atkins .....4143 West Madison St., Chicago, Ill.

MEMBERS REINSTATED

Boston Branch

John J. Draine.....11 Boyd St., Providence, R. I.
Indianapolis—Mr. Chas. Buchanan..840 W. 49th Place, Chicago, Ill., Asoc.

TRANSFERS

C. B. Jugle from New York Branch to Rochester Branch and received at Rochester

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DEATHS

Mr. W. S. Moore—Chicago Branch
Mr. G. J. Klein—Milwaukee Branch
Mr. Chas. Feltz, Rochester Branch
H. Schutzendorf—Detroit Branch
Steve Masek,--Bridgeport Branch

CHANGE OF ADDRESS

Chicago Branch—M. V. Baldwin
Chicago Branch—Jacob Hay

St. Louis Branch

F. H. Gillard.....To be 1834 S. E. Francis St., Grand Rapids, Mich

Boston Branch

Fred Greenwood.....To be 87 Appleton St., Atlantic, Mass.

BOSTON

Regular meetings are held third Friday of each month, at 8 p. m., at the American House, Boston. Secretary, A. W. Garrett, 821 Dorchester Ave., Dorchester, Mass.

BRIDGEPORT

Meets third Friday of each month in its laboratory, 260 John St., Bridgeport, Conn. Secretary, David Fleming, 97 Roosevelt St., Bridgeport, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., at the Hardware Club of Chicago, Room 1125. Secretary, F. J. Hanlon, 216 N. Jefferson St., Chicago, Ill.

CINCINNATI

Meets on the first and third Friday in each month, Y. M. C. A. Building. Secretary, W. J. Husing, 729 McMakin Ave., Cincinnati, Ohio.

CLEVELAND

Meets last Saturday of each month at Hotel Winton. Secretary, B. F. McCormick, 2024 Wyandotte Ave., Lakewood, O.

CONNECTICUT VALLEY

Meets on the second Tuesday of each month at 202 Washington St., Hartford, Conn. Secretary, Tennant Elwin, Newington, Conn.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, C. Van Derau, 61 Bish Ave., Dayton, Ohio.

DETROIT

Meets first Friday of each month at the Board of Commerce, Lafayette and Sheldon, at 8 p. m. Secretary, E. W. Woodmensee, 1427 Lee Place, Detroit, Mich.

GRAND RAPIDS

Meets on the second Wednesday of each month at the Vocational High School, 129 Bostwick Ave., N.E. Secretary, Chas. S. Whalley, 931 Pine Ave., N.W., Grand Rapids, Mich.

INDIANAPOLIS

Meets the second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

MILWAUKEE

Meets second and fourth Thursdays of each month at the West Side Bank Bldg. Secretary, R. Steuernagel, 1508 Concordia Ave., Milwaukee, Wis.

MONTREAL

Secretary, A. Geroux, 48 Craig West, Montreal, Quebec, Canada.

NEWARK

Meets first and third Fridays of each month at No. 17 Central Ave., Newark, N. J. at 8 p. m. Secretary, Royal F. Clark, 71 Chadwick Ave., Newark, N. J.

NEW YORK

Meets second and fourth Fridays of each month at the Broadway Central Hotel Parlors, New York City. Secretary, John E. Sterling, 468 Grand Ave., Long Island City, N. Y.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, P. Uhl, 2432 North 29th St., Philadelphia, Pa.

PITTSBURGH

Meets first Saturday of each month at 8 p. m., at United States Bureau of Mines Bldg., Forbes St. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 26 Custom House St., Room 16. Secretary, C. J. Poyton, 269 Ohio Ave., Providence, R. I.

READING

Meets on the second Tuesday of each month. Secretary, William M. Fisher, 654 Gordon St., Reading Pa.

ROCHESTER

Meets every second and fourth Saturday of each month at the Hotel Seneca. Albert H. Doering, Secretary, 49 Cutler St., Rochester, N. Y.

SYRACUSE

Secretary, M. J. Crean, 109 Court St., Syracuse, N. Y.

ST. LOUIS

Meets first Tuesday of each month at Barr Branch Library, corner Jefferson and Lafayette Sts. Secretary, H. H. Williams, 4156 Botanical Ave., St. Louis, Mo.

TOLEDA

Meets first Thursday of each month at Toledo University Science Building, Electro-Platers' Room, corner Cherry and Page Sts. Secretary, H. L. Myers, 410 Palmer, Toledo, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Secretary, E. S. Turner, 873 St. Clair Ave., Toronto, Ontario, Canada.

WATERBURY

Meets every second and fourth Friday of each month. Secretary, Wm. Delage, 47 Prospect St., Waterbury, Conn.

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